

EXHIBIT 7

W0349872

PC1/U0349872

1

1 METHOD FOR THE MANUFACTURE OF AND STRUCTURE
OF A LAMINATED PROXIMITY CARD

3 Background of the Invention

3

1. Field of the Invention

The invention relates to the field of laminated cards used for interactive applications such as access cards, control cards, identification cards, credit cards, or labels, and in particular relates to a method of manufacture and a structure for a laminated proximity card wherein an object is accessed without insertion of the key card but merely its proximate position.

15 2. Description of the Prior Art

Access cards for opening locked gates, doors and the like are well known and have become virtually universal in the United States and elsewhere for controlled access to restricted parking structures or lots and in many cases to the common areas in security controlled apartment buildings. Many different designs for access cards have been devised and they are generally based on some type of magnetic or metallic pattern which is sensed and embedded in the interior of the laminated card.

Pg 2 of 1

G02437

WU/MSR/

FCI/USMA/HDM

2

1 However, such access or key cards typically require
 their insertion into a reading device or placement directly
 upon a reading device, since the embedded metallic or
 magnetic pattern in the card must be placed in contact with
 5 or in very close proximity to a sensor in order for the
 pattern to be reliably decoded.

 The use and insertion of such access cards into card
 readers is beset with a number of problems. Firstly, in
 some cases the interior of the reader and sensor must be
 10 open to exterior access. This may result in problems of
 weathering, vermin and contamination from the injection of
 elements, foreign objects and soiled cards. In addition
 thereto, the requirement of physical insertion or placement
 of the card on or into the reading device limits and
 15 restricts the placement of the reading device, particularly
 when used in conjunction with vehicles which are restricted
 to travel on a roadway, path or rail. As a result, the
 range of applications to which such key access cards have
 been made has been limited both by commercial and human
 20 factors.

 In response thereto, the art has devised a number of
 designs, both in cards and readers, which do not require
 physical insertion of the card on or into a reading device,
 usually proximity cards. Proximity cards are in essence a
 25 circuit which communicates with the sensor through
 electromagnetic coupling. The "card" includes an antenna or

P1012

G02438

WQW/MSB

PCT/US88/0122

3

1 loop element coupled to a circuit, typically a digital
 circuit." Power to the circuit is inductively coupled
 through the antenna or loop which, when powered up, responds
 by generating a coded signal which is again transmitted
 3 through the loop or antenna to a sensor. The sensor can
 then respond to the coded signal to permit or deny access or
 to make such other recordings or ascertaining as may be
 expedient.

A typical example of such prior art interactive cards
 10 can be seen in BATES, "Electrical Verification and
Identification System", U.S. Patent 3,876,883 (1975);
 WALTON, "Identification System", U.S. Patent 4,323,516
 (1980); MILLERSON, "Active Electrical Card Device", U.S.
 Patent 3,827,954 (1975); and FORTNA et al., "Data
 15 Proximity Card System and Method of Forming Same", U.S.
 Patent 4,538,472 (1985). However, many of these card
 systems are not true proximity cards in that they require
 coupling of internal electrical leads to edge connectors on
 the card. Even if they are true proximity cards, such prior
 20 art cards are characterized by undue thickness or size of
 the card.

The typical proximity card has a loop antenna laid by
 conventional printed circuit board techniques on a piece of
 circuit board about the two-dimensional size of a standard
 25 credit card. However, the thickness of the circuit board
 may be substantial, greater than many credit cards. The

P1013

G02439

WO 8/28/07

PCT/US00/04334

1 circuit board is also typically rigid and breakable and does
 not laminate or adhere well to most substrates such as
 vinyl. The integrated circuit is then electrically coupled
 to the loop antenna and placed either on top of the printed
 2 circuit board, according to conventional circuit board
 fabrication technology, or placed on or in a recess in a
 printed circuit board. The printed circuit board is then
 disposed in a hollowed-out cavity defined in the core layer.
 Additional layers are placed and laminated on the integrated
 20 circuit, core layer and printed circuit. The additional
 layers carry graphics or provide an encapsulating or
 protective cover over the core layer, integrated circuit and
 printed circuit board. The layers are laminated with heat
 and/or pressure.

25 However, in most lamination processes the heat and
 pressure which may be applied to the integrated circuit is
 often sufficient to cause failure of the integrated circuit
 or its electrical connection to the printed circuit board.
 The result is that not only is the answer "card" much
 28 thicker than desirable and utilizes an expensive printed
 circuit board, but also a significantly lower yield rate is
 realized due to the occasional loss of function suffered by
 the integrated circuit during the lamination process. The
 unit cost of each proximity card is thus commensurately
 33 increased and the economic applications to which such cards
 can then be applied is correspondingly limited. Typically,

P1014

G02440

W03090301

PC7/1300/0134

5

1 such prior art proximity cards will have a manufacturing
cost of several dollars per card.

Furthermore, whenever a printed circuit board element,
carrying the security code-bearing circuit, is embedded in a
3 plastic card, the real possibility arises for disassembling
the card, extracting the printed circuit board and tampering
with the security code or fabricating a counterfeit card
therefrom.

What is needed, then, is a methodology for laminating a
10 card which is inexpensive, which is flexible, durable and
almost unbreakable, which is physically integrated and
easily manufacturable, and which is of a design which is
tamperproof. The resulting card should be truly comparable
in thickness to standard credit cards, so that it is as
15 flexible as a standard credit card, and can be manufactured
or laminated without any significant loss of function in the
integrated circuits, thereby resulting in mass production of
such cards at a low unit price.

20

Brief Summary of the Invention

The invention is a method for manufacturing a proximity
card comprising the steps of disposing a printed circuit
element directly onto a core layer, and disposing an
25 integrated circuit into a cavity defined in the core layer.
The integrated circuit and printed circuit are selectively

P1915

G02441

WOM/MSW

PCT/US87/1151

4

1 and electrically coupled with each other. At least one
 2 additional layer of material is disposed over the printed
 3 circuit element and integrated circuit disposed on the core
 4 layer. All the layers are laminated together to form an
 5 integrated card. As a result, the printed circuit element
 6 and integrated circuit element are integrated into the
 7 laminated integrated card without substantial alteration of
 8 the structure of the card.

9 The cavity is present into the core layer prior to
 10 disposition of the printed circuit element thereon.

11 In an alternative embodiment the cavity is cut into the
 12 core layer subsequent to disposition of the circuit element
 13 on the core layer.

14 The step of disposing the additional layer on the
 15 printed circuit element and integrated circuit element
 16 further comprises disposing a graphics layer on each side of
 17 the core layer and disposing a protective layer on each of
 18 the graphics layers. The core layer, printed circuit
 19 element, integrated circuit, the graphics layer and
 20 protective layers form an integrated card.

21 In one embodiment in the step of disposing the
 22 integrated circuit into the cavity in the core layer, the
 23 integrated circuit is entirely disposed in the cavity with
 24 little or no portion of the integrated circuit other than
 25 the leads necessary to couple the integrated circuit to the
 26 printed circuit element being exposed out of the cavity.

P1816

G02442

WU 00/0532

PCY/USM/01394

7

1 The invention can also be characterized as a method for
 fabricating a premissis card comprising the step of
 disposing a film on a core layer. The film carries a
 printed circuit element and an integrated circuit
 5 electrically coupled to the printed circuit element. The
 film is aligned with a cavity defined in the core layer such
 that when the film is disposed on the core layer, the
 integrated circuit is disposed on the film aligned with and
 into the cavity defined in the core layer. At least one
 10 additional layer of material is disposed on the film,
 printed circuit element and integrated circuit carried by
 the film. The film, core layer and at least one additional
 layer are laminated together to form an integrated card. As
 a result, the printed circuit element and integrated circuit
 15 are included within the laminated card in an integral manner
 without substantial structural alteration of the laminated
 card.

In one embodiment each of the steps is continuously
 performed. The film contains a plurality of printed circuit
 20 elements and corresponding integrated circuits which are
 coupled together. The film is disposed on the core layer
 as a continuous web. The core layer forms a continuous web
 having a corresponding plurality of cavities. One cavity
 corresponds to each integrated circuit carried by the
 25 continuous web of film. The additional layer is a
 continuous web of material disposed upon the continuous web

P1917

G02443

W030021

PCF/CHRYSLER

8

1 of film carrying the printed circuit element and integrated
circuit, and is disposed upon the continuous web of core
layer.

5 The method further comprises the step of die-cutting
the integrated web of laminated layers to form a plurality
of separate cards. Each card includes one integrated
circuit and printed circuit element.

Where each of the steps is continuously performed, the
film is disposed on the core layer as a continuous web
10 containing a plurality of printed circuit elements and
corresponding integrated circuits which are coupled
together. The core layer forms a continuous web having a
corresponding plurality of cavities. One cavity corresponds
to each integrated circuit carried by the continuous web of
15 film. The one additional layer is a continuous web
disposed upon the continuous web of film carrying the
printed circuit element and integrated circuit and is
disposed upon the continuous web of core layer.

The lamination is also a laminated, integrated proximity
20 card comprising a core layer with a cavity defined
therethrough. An integrated circuit with leads is disposed
in the cavity. Little or no portion of the integrated
circuit, except such leads as may be connected thereto, is
disposed exterior to the cavity of the core layer. A
25 printed circuit element is disposed on the core layer and
selectively electrically coupled to the integrated circuit.

P1816

G02444

WOM/0001

PCT/US00/0124

3

1 At least one additional layer is disposed over the printed
circuit element, integrated circuit and core layer. The one
additional layer is bonded with at least the core layer to
form the integrated card. As a result, a thin, flexible
5 proximity access card is provided in which the printed
circuit element and integrated circuit are integrated
without substantial structural alteration of the integrated
card.

The invention is still further a method of electrically,
10 accessing an integrated circuit within a laminated card
having no exposed electrical contacts, but including at
least one electrical pad disposed within the laminated card.
The electrical pad is electrically communicated with the
integrated circuit. The method comprises the steps of
15 aligning at least one needle over the card. The needle is
aligned with respect to the at least one pad disposed within
the laminated card. The aligned needle is disposed into the
material of the card and at least into contact with the pad.
The needle and pad are then connected with each other to
20 permit communication of electrical signals through the
needle to the pad. Electrical signals are communicated
through the needle to the pad and hence to the integrated
circuit. The needle is then removed from the laminated
card. As a result, the integrated circuit within the
25 laminated card can be inexpensively and simply electrically

P1919

G02445

WFO 04/04/202

FCT/2004/0304

10

2. account for the purpose of progressing the integrated circuit.

In one embodiment in the step of removing the needle from the card, a puncture hole is left in the card.

The method may in another embodiment, further comprise the step of removing the puncture hole to substantially restore the laminated card to its original configuration prior to the step of disposing the needle into the laminated card.

10 In one embodiment in the step of forming the substrate
hole, the substrate hole is filled with a nonconductive
material.

In another embodiment, in the step of removing the
puncture hole from the laminated card, the puncture hole is
15 closed by application of pressure to the card in the
vicinity of the puncture hole.

The invention is also a method for manufacturing a proximity card comprising the steps of providing a printed circuit element and integrated circuit electrically coupled thereto on a core layer. The additional layer of material is softened in preparation for disposition onto the core layer, the integrated circuit and the circuit element. The softened additional layer of material is disposed over the printed circuit element and integrated circuit disposed on the core layer. All the layers are then laminated together to form an integrated card. As a result the printed

FY 2020

G02448

WCI/04/0002

PCI/US/04/0002

11

1 circuit element and integrated circuit element are
integrated into the laminated integrated card without
substantial alteration of the laminated and integrated
structure of the card.

5 The method further comprises the step of hardening the
softened layer after the softened layer is laminated to the
core layer.

In another embodiment the softened layer may be an
inherently soft layer of material which never hardens.

10 In still another embodiment the step of laminating
includes embedding the integrated circuit into the softened
layer.

The invention can still further be characterized as a
method for fabricating a proximity card comprising the steps
15 of providing a core layer which directly carries a printed
circuit element and an integrated circuit electrically
coupled to the printed circuit element. At least one
additional layer of material is disposed on the core layer,
printed circuit element and integrated circuit carried by
20 the core layer. The core layer and the additional layer are
laminated together to form an integrated card.

As in other embodiments, each of the steps is
continuously performed. The core layer, containing a
plurality of printed circuit elements and correspondingly
25 integrated circuits coupled together, forms a continuous web
having a corresponding plurality of cavities. One cavity

P1021

G02447

WO 2006/01224

PCT/US2006/01224

12

1 corresponds to each integrated circuit carried by the continuous web of core layer. The additional layer is a continuous web of material disposed upon the continuous web of core layer.

5 The invention and its various embodiments are better visualized by viewing the following drawings where like elements are referenced by like numerals.

Brief Description of the Drawings

10

Figure 1 is a diagrammatic outway perspective view of a proximity card built according to the invention as seen through the section lines 1-1 of Figure 3.

15 Figure 2 is a side sectional outway view of the card of Figure 1 after it has been laminated into a composite structure.

Figure 3 is a plan view of the card of Figures 1 and 2 with the upper layers removed to show the underlying antenna or loop and integrated circuit.

20 Figure 4 is a diagrammatic view of a web process whereby cards according to the invention may be mass manufactured.

Figure 5 is a series of diagrammatic side sectional views of a card made according to Figures 1-4 being probed 25 and programmed according to the invention.

P102

G02448

WOMENSE

PCT/US84/01324

13

1 The invention and its various embodiments, together
 with its method of manufacture, may be better understood by
 now turning to the following detailed description.

3 Detailed Description of the Preferred Embodiments

A proximity sensor card is fabricated in a manner such
 that the printed circuit element and integrated circuit
 within the card is integrated into a card without
 10 substantially interfering with either the physical or
 structural characteristics of the card. What results is a
 truly thin, flexible and inexpensively mass produced
 proximity card. The proximity card is manufactured by
 disposing a printed circuit element onto a core layer and
 15 placing the integrated circuit which is coupled to the
 printed circuit element into a cavity defined in the core
 layer. The cavity is defined through the core layer and
 completely encloses the integrated circuit so that
 little or no portion of the integrated circuit, other than
 20 its leads, are exposed above the surface of the core layer.
 A graphics layer is then disposed on each side of the core
 layer. The graphics layer is also disposed on top of the
 printed circuit element and integrated circuit disposed on
 the core layer. A protective layer is then disposed on the
 25 outside of each of the graphic layers. The multiple layers
 are then laminated by pressure and heat and/or adhesive to

P1023

G02449

WO 04/0002

14

PCI/USP/01/04

1 Form a bonded integrated-card. Due to the structure and
method of fabrication, there is virtually no loss of yield
due to failure of the integrated circuit caused by any of
the lamination steps.

5 In an alternative embodiment the card is made according
to the above procedure by disposing a continuous film
carrying the printed circuit elements and integrated
circuits onto a continuous web of core material with
cavities correspondingly defined therein. The graphics and
10 protective layers are similarly continuously web-fed into a
lamination press and die-cutting station.

Figure 1 is an enlarged cutaway exploded perspective
view of a preferred embodiment of a proximity card
manufactured according to the methodology of the invention
15 wherein the integrated circuit and the accompanying
integrated circuit element are integrated into the laminated
structure of the card as opposed to being inserted or
unspecialized therein. Turning first to Figure 1, it can
readily be appreciated that circuit 10 is disposed within a
20 die-cut through-cavity 12 cut into a core layer 14. Die-cut
cavity 12 is better shown in the plan view of Figure 3.
Core layer 14 is approximately equal in thickness to circuit
10, and may have the two-dimensional planar extent of a
standard credit card. Integrated circuit 10 is disposed in
25 cavity 12 and is supported by its electrical leads with a
printed circuit element 16 shown in side view as being,

P1924

G02450

WQ/m/psd

PCT/US00/0134

13

1 disposed on the top of core layer 14. After electrical
connection is made to circuit 10, it is stabilized within
cavity 12 and the wiring bonded to circuit 10 is protected
by placement of a nonconductive epoxy on and around circuit
10. This facilitates handling of a sheet of material with a
plurality of circuits 10 therein. Printed circuit element
16 is again better depicted in the plan view of Figure 3
wherein the overlying layers disposed on core layer 14 have
been removed for clarity of view.

18 In the illustrated embodiment of Figures 1-3, printed
circuit element 16 is an antenna or loop which is directly
deposited on the upper surface of core layer 14 by
conventional photolithographic techniques. Core layer 14 is
typically composed of a polyester or vinyl material. The
25 copper or other metal which comprises printed circuit
element 16 is deposited by conventional means on core layer
14, sensitized, exposed to a photographic pattern, and
selected portions etched therefrom. Because of the possible
temperature sensitivity the material of core layer 14, care
20 must be taken to maintain the temperature of the
photographic and chemical etch below the melting point of
the material of core layer 14. In the case of a typical
polyester or vinyl, the copper etch might be a cold etch
followed by a mold drying step.

25 In the case of vinyl, the temperature during the method
steps relating to the deposition and formation of printed

P1925

G02451

WFO 00/00002

16

PCT/CN/2004/00002

- 1 circuit element 16 is generally retained in a shape so as
not to distort the virgin substrate. In the illustrated
embodiment, printed circuit element 16 which is an antenna
or loop, is formed on the upper surface of core layer 14, it
being expressly understood that it is also well known to
include printed circuit layers on both sides of a substrate
or on a multiple number of each substrate or core layers
with through connections provided through the thickness of
the core layer(s). Therefore, it is entirely within the
10 scope and spirit of the present invention that the antenna
or loop may include a similarly formed printed circuit
element on the reverse side of layer 14 to that shown in
Figure 3 or multiple layers.

- Once printed circuit element 16 has been formed onto
15 the surface of core layer 14, cavity 12 is punched through
layer 14 if not pre-punched and integrated circuit 10 is
disposed into cavity 12. Preferably, the thickness of
integrated circuit 10 is somewhat less than 0.015 inch, the
thickness of core layer 14, so that integrated circuit layer
20 10 is entirely suspended or disposed within and protected by
cavity 12. In other words, in the preferred embodiment
little or no portion of the integrated circuit 10, other
than leads connected thereto, extend beyond the upper or
lower planar surfaces of core layer 14. It is also to be
25 understood that circuit 10 may similarly be disposed in

P1326

G02452

WO 2004/000002

17

PCI/US2004/01724

1 whole or in part in a similar cavity defined in the opposing
graphics layer 18 if desired.

Integrated circuit 10 is provided with a plurality of
leads extending from the semiconductor die in which the
5 circuit is formed. These leads provide a means whereby the
die of integrated circuit 10 can be suspended within cavity
12 and also connected to printed circuit element 14.
Connection between integrated circuit 10 and printed circuit
element 14 is made through conventional processes such as
10 soldering, ultrasonic welding, wedge bonding or the like.

A thinner graphics layer 18 is then placed on one or
both sides of core layer 14. Graphics layer 18 is typically
0.005-0.010 inch in thickness and has printed matter
disposed on its exposed surface, that is the surface
15 oriented away from core layer 14, such as instructions,
designs, company names, and logos, as may be desired for
the identification and use of the proximity card.

A protective layer 20 is then placed outside each
protective layer 18, that is on the side of graphics layer
20 18 oriented away from core layer 14. Protective layer 20 is
thinner still and is generally 0.001-0.003 inch in thickness
and is typically transparent or at least translucent to
allow the graphics, which may have been impressed or printed
on graphics layers 18 to be visible.

25 The plurality of layers now comprise a composite card,
generally denoted by reference numeral 22 as best

P1827

G02453

WO 04/000002

PC/100/100/100

11

- 1 illustrated in the side sectional view of Figure 2. The composite card 12 does in fact have a thickness 24 which is comparable to a standard credit card. Printed circuit element 16 may be slightly or entirely embedded into core layer 14 during the lamination process. The enlarged side sectional view of Figure 2 shows the assembled circuit of Figure 1 and better depicts the relationship of circuit 10 within cavity 12 to printed circuit element 16 and overlying graphics layer 18. Circuit 10 has a thickness substantially equal to the combined thickness or depth of cavity 12 and printed circuit element 16. The thickness of core layer 14 is chosen together with the thickness of circuit element 16 to approximate the thickness of circuit 10. Wires 25 are then connected between circuit 10 and printed circuit element 16 in a conventional manner. The wires are therefore disposed slightly above the upper surface of circuit 16 and printed circuit element 16 and, during the lamination process, become embedded, at least in part, into overlying graphics layer 18.
- 20 It thus may be readily appreciated from Figure 2 that the integrated circuit and its associated printed circuit element have been virtually integrated into the composite structure of card 12 with no substantial or material disruption or interference of the lamination or the composite structure of the card itself. The assembled composite, as shown in Figure 2, is produced by
- 35

P1928

G02454

WO 2004/01312

PCT/JP2003/013124

11

1 conventional means typically by application of heat and/or
 300-400 psi lamination pressure exerted on card 22 across
 opposing layers 20 and all intervening layers. It can also
 be readily appreciated that during hot pressing, virtually
 5 no pressure or strain is applied to integrated circuit 10
 which is housed entirely within cavity 12 cut into some
 layer 14.

Even if the card is not laminated by roll laminating or
 hot pressure laminating, but is laminated through an
 10 adhesive, the integrated circuit and printed circuit element
 are so integrated within the card, that printed circuit
 element 16 is substantially characterized by the elasticity
 of layers 14, 18 and 20. There is such less limitation
 placed upon the bending of the card due to printed circuit
 15 16 as is typical of the prior art, namely by the limited
 flexibility of a glass printed circuit board subject to
 fracture. Indeed, card 22 may be bent to the limitations of
 the materials from which it is fabricated and beyond before
 the failure of printed circuit element 16 is expected.
 20 Moreover, there is virtually no significant reduction in
 yield due to loss of function of integrated circuit 10
 suffered during the lamination process. The yield during
 lamination is thus nearly 100% and the per unit cost of the
 card does not significantly increase due to waste or loss of
 25 materials during the lamination process.

P1929

G02455

WQ 000000

28

PCI/12345678

1 Turn now to Figure 4, wherein one method of
 manufacturing the cards of Figures 1-3 is diagrammatically
 shown as a continuous web process. A roll 26 of material or
 film 28 carries integrated circuit 10 and printed circuit
 element 16 on a thin film 28 similar in size and
 construction to photographic film. However, instead of
 photographic film is not necessarily used but a plastic
 material such as polyester or vinyl film is employed, which
 is bondable to materials used within the card. Thus, the
 10 embodiment of Figure 4, as opposed to the embodiment of
 Figures 1-3, contemplates the formation and electrical
 coupling of integrated circuit 10 and printed circuit
 element 16 on film 28 rather than directly on core layer 14.
 Circuit 10 may be placed on top of film 28 or in a preset
 15 hole defined into film 28 and suspended thereacross by its
 leads as may be desired.

 The circuit bearing film 28 is continuously fed by
 conventional means onto a continuous web of core material
 114 in which pre-punched cavities 112 have been defined.
 20 Film 28 is aligned and synchronized such that printed
 circuits 10 are registered with cavity 112 as film 28 is
 laid upon core layer 114. As film 28 is being laid on core
 layer 114 as diagrammatically depicted in Figure 4, also
 simultaneously therewith are laid appropriately prepared
 25 protection layers 116 and protective layers 120. Layers 114,
 116 and 120 perform the same functions and are related to

P1830

G02456

WOM 040002

PCP/L384/0174

31

1 each other in an analogous fashion to the corresponding
 5 layers 14, 16 and 20, respectively, of the embodiment of
 Figures 1-3.

Layer 114, film 28 and layers 118 and 120, having thus
 5 been assembled to form a composite sandwich according to the
 teaching of Figures 1-3, are conveyed in a continuous
 process to a lamination press diagrammatically shown in
 Figure 4 and generally denoted by reference numeral 122.
 While in press 122 the multiple layers just described are
 10 pressed to form a bonded or laminated composite similar to
 that shown and described in connection with Figure 2.

The laminated web continues to a die cutting station
 diagrammatically depicted in Figure 4 and generally denoted
 by reference numeral 124. The perimeter of the card is
 15 then cut from the continuous web of laminated material and
 is die-cut, resulting in the finished proximity access card
 126 again diagrammatically depicted in plan view in Figure 4
 as issuing in a continuous process from the manufacturing
 line depicted in Figure 4.

20 The embodiment of Figure 4 has been described as a
 continuous web process, but the methodology of manufacture
 which contemplates the use of a circuit bearing film 28,
 whether in the form of a roll or as individual plates or
 carriers, could also be utilized in a discrete lamination
 25 process where each card is separately fabricated in a

P1831

G02457

WU 84/8632

PCT/US83/01324

22

- 1 analogous fashion to that suggested in connection with the
 2 subsequent of Figures 1-3.

Figure 3 is a simplified and highly enlarged series of
 five sectional views of a circuit devised according to the
 methodology and structure as depicted in connection with
 Figures 1-4. Integrated circuit 10 is probed by a plurality
 of needles 30, one of which is shown in Figure 5. Each
 needle may have a thickened shank 32 and a conical or
 tapered thin point 34.

- 10 In step 1 of the illustration of Figure 5, needle 30 is
 shown poised above protective layer 20 and is about to be
 inserted through layers 20 and 18 into a conductive pad
 which was part of printed circuit element 16.

- In step 2 in Figure 5 needle 30 has been fully inserted
 15 into card 22 so that needle point 34 has made at least a
 partial penetration into an appropriately positioned pad of
 circuit element 16. Needle 30 is therefore in electrical
 contact with the pad of circuit element 16. Therefore,
 electrical signals can then be communicated through needle
 20 30 to integrated circuit 10. Although the diagrammatic
 depiction of Figure 5 shows only one needle 30 in contact
 with the pad of printed circuit element 16, it is of course
 contemplated that a plurality of such needles may be
 simultaneously inserted if desired to allow parallel input
 25 and programming of circuit 10.

P1832

G02458

w024962

PCT/US95/01224

23

1 In step 3 of Figure 5 needle 30 has been withdrawn from
card 21 leaving puncture holes 38 through layers 20 and 18 to
the pad of printed circuit element 16 which has been
contacted. Since the needle tip 34 of needle 30 is very
5 small, it is possible to leave puncture holes 38 in card 21
without any substantial effect or degradation of the card's
performance or integrity.

However, if desired, puncture holes 38 can later be
covered with an epoxy or filler, as is shown in step 4 of
10 Figure 5 where hole 38 is sealed by the application of heat
and pressure applied through an anvil element
diagrammatically depicted as element 36. Puncture hole 38
is forced by the pressure and heat of anvil 36 to close and
form a completely or substantially completely repaired
15 closure 40. Step 5 of Figure 5 shows a "healing" of layers
18 and 20 which leaves nearly no trace.

The methodology of Figure 5 provides some advantages
over an alternative method, for example, of predefining
holes through layers 20 and 18 to expose the contact pads of
20 printed circuit element 16 for later temporary insertion of
thin electrodes. Firstly, there is no need for careful
alignment or registration of preformed or defined holes in
layers 20 and 18 with underlying pads of printed circuit
element 16. Instead, needles 30 need only be aligned
25 directly with the contact pads of printed circuit element 16
or equivalently core layer 14, which can be small, .

P1233

G02459

W012,0000

PCT/JP00001224

24

- 1 accomplished by insertion of card 22 in a jig included
 within a punching station in which needles 38 are fixed.
 This simplifies not only the programming of circuit 10
 within card 22, but also the fabrication of a card 22
 5 generally.

The embodiments thus far discussed have each
 contemplated the existence of a hole in a core layer or at
 least in an opposing relatively thick layer into which the
 circuit die is inserted. It is also contemplated as being
 10 within the scope of the invention that the thin layer
 opposing the circuit die may be heated to temporarily soften
 the layer to allow the circuit die to be embedded into the
 softened layer during lamination without undue stress being
 exerted upon the circuit die or other damage being
 15 caused to the die or circuit elements. Drying or cooling of
 the softened layer will then provide a relatively hard
 encasement to protect the circuit die.

A process similar to that of Figure 4, namely a process
 wherein the circuit element and circuit die is on a carrier,
 20 may also be practiced wherein film 20 is not a thin film but
 a thick layer similar to core layer 114 and wherein core
 layer 114 is deleted. In other words, the circuit die and
 circuit elements may be disposed directly on a roll, strip,
 or discrete carrier having a thickness comparable to the
 25 core layer and then laminated to additional layers without
 the need for core layer 114.

P1834

002460

WO 00/00000

PCT/US99/00000

25

1 many modifications and alterations may be made by those
having ordinary skill in the art without departing from the
spirit and scope of the invention. Therefore, the
illustrated embodiment must be understood as being shown
2 only for the purposes of example and not as limiting the
invention which is defined in the following claims.

P1635

G02461

WJW/00001

PCT/100001004

16

CLAIMS

1. A method for manufacturing a proximity card comprising the steps of:
 - disposing a printed circuit element directly onto a core layer;
 - disposing an integrated circuit into a cavity defined in said core layer;
 - selectively and electrically coupling said integrated circuit and printed circuit element with each other;
 - disposing at least one additional layer of material over said printed circuit element and integrated circuit disposed on said core layer; and
 - laminating all said layers together to form an integrated card,
 whereby said printed circuit element and integrated circuit element are integrated into said laminated integrated card without substantial alteration of the laminated and integrated structure of said card.
2. The method of claim 1 wherein said cavity is formed into said core layer prior to disposition of said printed circuit element thereon.

P1000

G02462

WO 2004/012321

PCT/US2003/012321

27

3. The method of Claim 1 wherein said cavity is cut into said core layer subsequent to disposition of said circuit element on said core layer.

4. The method of Claim 1 where said step of disposing said at least one additional layer on said printed circuit element and integrated circuit element further comprises disposing a graphics layer on each side of said core layer and disposing a protective layer on each said graphics layer, said core layer, printed circuit element, integrated circuit, graphics layer and protective layers forming an integrated card.

5. The method of Claim 1 where in said step of disposing said integrated circuit into said cavity in said core layer, said integrated circuit is entirely disposed in said cavity with little or no portion of said integrated circuit other than said leads necessary to couple said integrated circuit to said printed circuit element are exposed out of said cavity.

6. The method of Claim 1 wherein said cavity is present into said core layer prior to disposition of said printed circuit element thereon.

P2837

G02463

W02/0001

PC/US/01/01

28

1 7. The method of Claim 1 wherein said cavity is
cut into said core layer subsequent to disposition of said
circuit element on said core layer.

1 8. A method for fabricating a proximity card
comprising the steps of:
 disposing a film on a core layer, said film
 carrying a printed circuit element and an integrated circuit
5 electrically coupled to said printed circuit element, said
film aligned with a cavity defined in said core layer such
that when said film is disposed on said core layer, said
integrated circuit disposed on said film is aligned with and
fits said cavity defined in said core layer;
10 disposing at least one additional layer of
material on said film, printed circuit element and
integrated circuit carried by said film; and
 laminating said film, core layer and at least one
additional layer together to form an integrated card,
15 whereby said printed circuit element and
integrated circuit are included within said laminated card
in an integral manner without substantial structural
alteration of said laminated card.

1 9. The method of Claim 8 where each of said steps
is continuously performed, said film containing a plurality
of printed circuit elements and corresponding integrated

P1538

G02484

WO 2004/080002

PCT/JP2003/014102

29

circuits coupled together, said film being disposed on said
 5 core layer as a continuous web, said core layer forming a
 continuous web having a corresponding plurality of cavities,
 one cavity corresponding to each integrated circuit carried
 by said continuous web of film, and said at least one
 additional layer being a continuous web of material disposed
 10 upon said continuous web of film carrying said printed
 circuit element and integrated circuit, and upon said
 continuous web of core layer.

1 10. The method of Claim 9 further comprising the
 step of die-cutting the integrated webs of laminated layers
 to form a plurality of separate cards, each card including
 one integrated circuit and printed circuit element,

1 11. The method of Claim 8 where said step of
 disposing said at least one additional layer further
 comprises disposing a graphics layer on each side of said
 core layer and a protective layer on each graphics layer
 5 opposite said core layer, and where in said step of
 laminating, said core layer, printed circuit element,
 graphics layers and protective layers are laminated into
 said integrated card.

1 12. The method of Claim 11 where each of said
 steps is continuously performed, said film being disposed on

P1939

G02465

WITNESSES

ATTORNEYS

38

said core layer as a continuous web containing a plurality of printed circuit elements and corresponding integrated circuits coupled together, said core layer forming a continuous web having a corresponding plurality of cavities, one cavity corresponding to each integrated circuit carried by said continuous web of film, and said at least one additional layer being a continuous web disposed upon said continuous web of film carrying said printed circuit element and integrated circuit and upon said continuous web of core layer.

13. The method of Claim 12 further comprising the step of die-cutting the integrated web of laminated layers to form a plurality of separate cards, each card (including one integrated circuit and printed circuit element).

14. A laminated, integrated proximity card comprising:

- a core layer with a cavity defined therethrough;
- an integrated circuit having leads disposed in said cavity, little or no portion of said integrated circuit, except said leads, being disposed exterior to said cavity of said core layer;
- a printed circuit element disposed on said core layer and selectively electrically coupled to said integrated circuit; and

P1340

G02458

WOMEN

PC7/US000113*

3)

at least one additional layer disposed over said
 printed circuit element, integrated circuit and core layer,
 said at least one additional layer being bonded with at
 least said core layer to form said integrated card,

15 whereby a thin, flexible proximity access card is
 provided in which said printed circuit element and
 integrated circuit are integrated without substantial
 structural alteration of said integrated card.

1 15. The card of claim 14 wherein said at least
 one additional layer further comprises a graphics layer
 disposed on each side of said core layer and a protective
 layer disposed on each graphics layer on the side of said
 5 graphics layer opposite said core layer, and wherein said
 protective layer, graphics layer and core layers are bonded
 together to form said integrated card.

1 16. The card of claim 14 wherein said at least
 one additional layer is bonded to said core layer by
 lamination.

1 17. The card of claim 15 wherein said protective
 layer, graphics layer and core layer are mutually bonded
 together by lamination.

P1941

G02487

W012,0007

PCT/CN/2004/0124

32

1 18. The card of Claim 14 wherein said printed
circuit element and integrated circuit element are disposed
directly upon and in said core layer respectively.

2 19. The card of Claim 14 wherein said printed
circuit element and integrated circuit are disposed on a
film and said film, carrying said printed circuit element
and integrated circuit, are disposed on said core layer,
5 said film being registered with said core layer so that said
integrated circuit is disposed within said cavity defined in
said core layer.

1 20. The card of Claim 19 wherein said at least
one additional layer further comprises a graphics layer
disposed on each side of said core layer and a protective
layer disposed on each graphics layer on the side of said
2 graphics layer opposite said core layer, and wherein said
protective layer, graphics layer and core layers are bonded
together to form said integrated card.

1 21. A method of electrically accessing an
integrated circuit within a laminated card having no exposed
electrical contacts, but including at least one electrical
pad disposed within said laminated card, said electrical pad
5 being electrically communicated with said integrated
circuit, said method comprising the steps of:

P1842

G02468

WO 2004/01234

PC7/US004/124

33

aligning at least one needle over said card, said needle being aligned with respect to said at least one pad disposed within said laminated card;

10 disposing said aligned needle into the material of said card and at least into contact with said pad, said needle and pad then being connected with each other to permit communication of electrical signals through said needle to said pad;

15 communicating electrical signals through said needle to said pad and hence to said integrated circuit; and removing said at least one needle from said laminated card,

whereby said integrated circuit within said
20 laminated card can be independently and singly electrically accessed for the purposes of programming said integrated circuit.

1 22. The method of Claim 21 where in said step of removing said needle from said card a puncture hole is left in said card.

1 23. The method of Claim 22 further comprising, the step of removing said puncture hole to substantially restore said laminated card to its original configuration prior to said step of disposing said needle into said laminated card.

P1943

G02469

WIDENING

PCT/US88/01114

34

1 24. The method of Claim 23 where in said step of
removing said puncture hole, said puncture hole is filled
with a nonconductive material.

1 25. The method of Claim 23 where in said step of
removing said puncture hole from said laminated card, said
puncture hole is closed by application of pressure to said
card in the vicinity of said puncture hole.

1 26. A method for manufacturing a proximity card
comprising the steps of:
 providing a printed circuit element and integrated
circuit electrically coupled thereto on a core layer;
5 softening at least one additional layer of
material in preparation for disposition onto said core
layer, said integrated circuit and said circuit element;
 disposing said softened additional layer of
material over said printed circuit element and integrated
10 circuit disposed on said core layer; and
 laminating all said layers together to form an
integrated card,
 whereby said printed circuit element and
integrated circuit element are integrated into said
15 laminated integrated card without substantial alteration of
the laminated and integrated structure of said card.

P1944

G02470

WO 2006/012122

PCT/US2004/012122

13

1 27. The method of Claim 26 further comprising the
 step of hardening said softened layer after said softened
 layer is laminated to said core layer.

1 28. The method of Claim 26 wherein said softened
 layer is an inherently soft layer of material and never
 hardens.

1 29. The method of Claim 27 where said step of
 laminating includes embedding said integrated circuit into
 said softened layer.

1 30. A method for fabricating a proximity card
 comprising the steps of:
 providing a core layer, said layer directly
 carrying a printed circuit element and an integrated circuit
 1 electrically coupled to said printed circuit element;
 disposing at least one additional layer of
 material on said core layer, printed circuit element and
 integrated circuit carried by said core layer; and
 laminating said core layer and at least one
 10 additional layer together to form an integrated card,
 whereby said printed circuit element and
 integrated circuit are included within said laminated card
 in an integral manner without substantial structural
 alteration of said laminated card.

P1545

G02471

WO 02/0272

PCT/US02/0004

36

1 31. The method of Claim 15 where each of said
 steps is continuously performed, said core layer containing
 a plurality of printed circuit elements and corresponding
 integrated circuits coupled together, said core layer
 5 forming a continuous web having a corresponding plurality of
 cavities, one cavity corresponding to each integrated
 circuit carried by said continuous web of core layer, and
 said at least one additional layer being a continuous web of
 material disposed upon said continuous web of core layer
 10 carrying said printed circuit element and integrated
 circuit.

1 32. The method of Claim 20 further comprising the
 step of die-cutting the integrated webs of laminated layers
 to form a plurality of separate cards, each card including
 one integrated circuit and printed circuit element.

1 33. The method of Claim 30 where said step of
 disposing said at least one additional layer further
 comprises disposing a graphics layer on each side of said
 core layer and a protective layer on each graphics layer
 5 opposite said core layer, and where in said step of
 laminating, said core layer, printed circuit element,
 graphics layers and protective layers are laminated into
 said integrated card.

P1840

G02472

WO 2004/010001

PCT/JP2003/010001

27

34. The method of Claim 33 wherein each of said
 steps is continuously performed, said core layer being
 disposed on said core layer as a continuous web containing a
 plurality of printed circuit elements and corresponding
 integrated circuits coupled together, said core layer
 forming a continuous web having a corresponding plurality of
 cavities, one cavity corresponding to each integrated
 circuit carried by said continuous web of core layer, and
 said at least one additional layer being a continuous web
 disposed upon said continuous web of core layer carrying
 said printed circuit element and integrated circuit and upon
 said continuous web of core layer.

P1947

G02473

WO 01/99672

PCT/US99/01224

FIG. 1

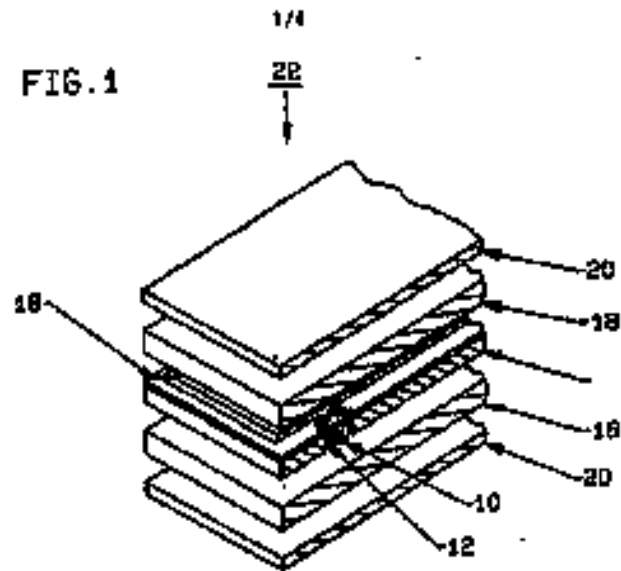
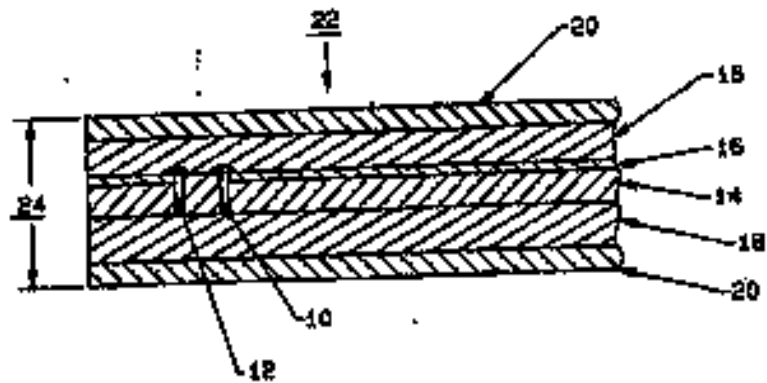


FIG. 2



P1948

G02474

WO 2004/02521

PCT/US2003/01334

2/4

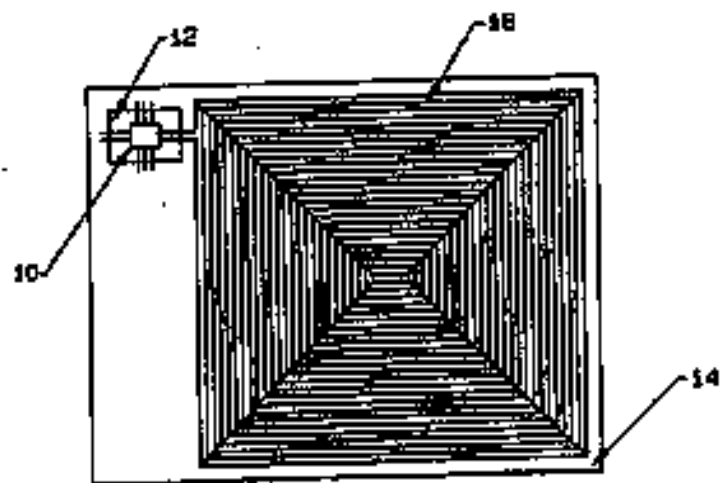


FIG. 3

P1549

G02475

WO 2006/01306

PCT/US2004/01306

2/4

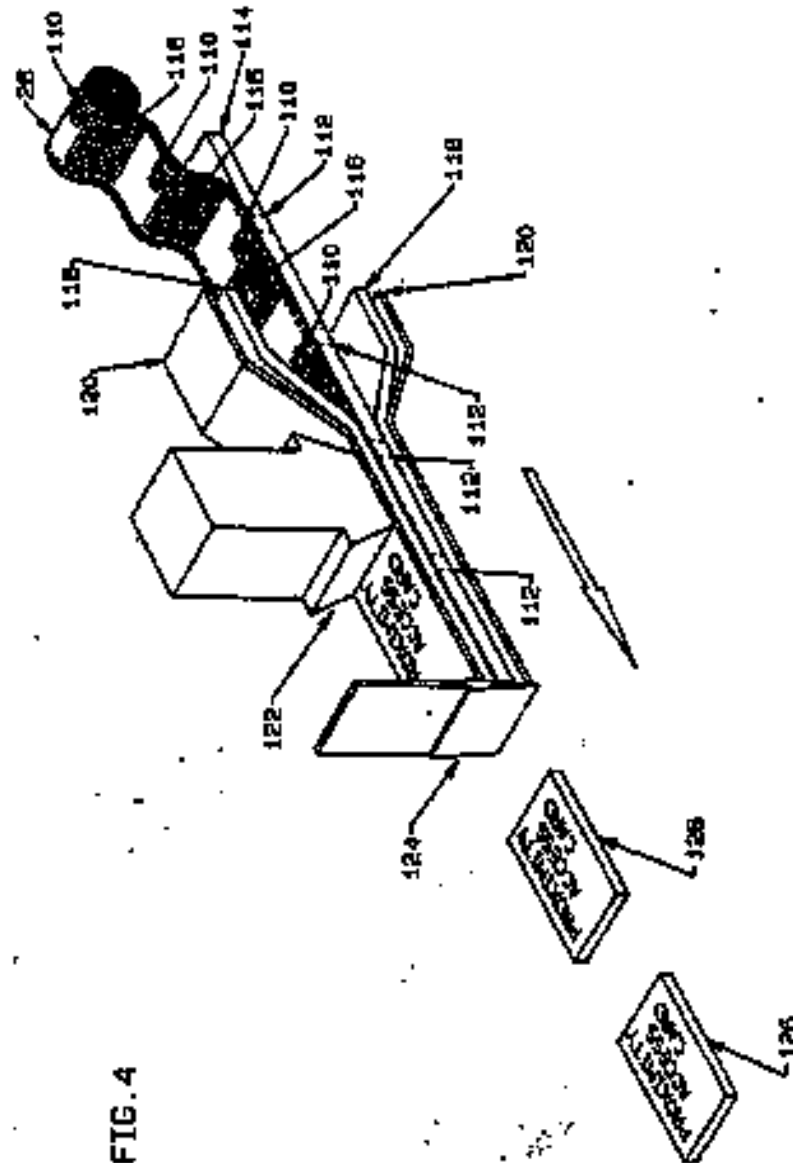


FIG. 4

P1980

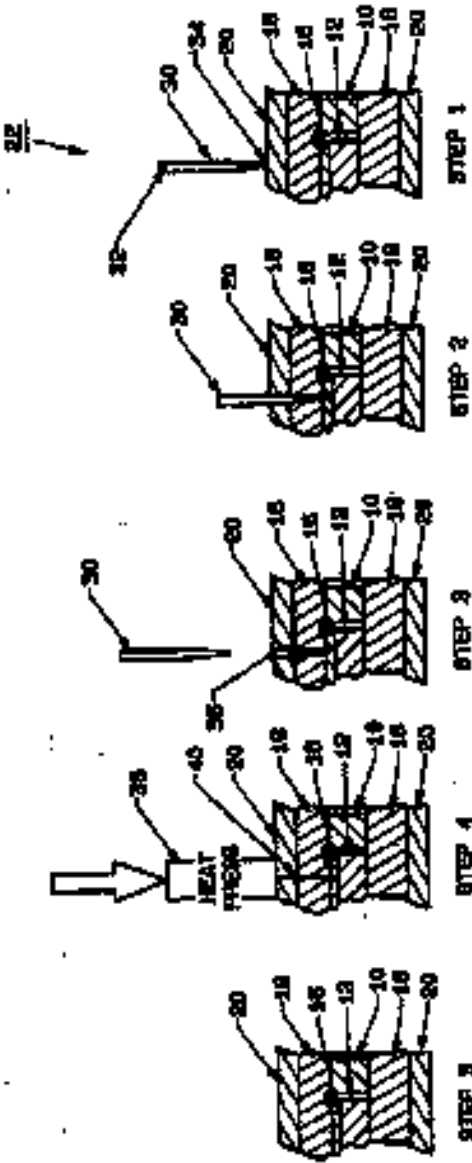
G02476

970 04/00002

PCT/US04/01254

4/4

FIG. 5



P1961

G02477

EXHIBIT 8

529bleih

1 UNITED STATES DISTRICT COURT
2 SOUTHERN DISTRICT OF NEW YORK

3 LEIGHTON TECHNOLOGIES, LLC,

4 Plaintiff-Counterclaim Defendant,

5 v.

64 Civ. 2496(CM)

MARKMAN HEARING

7 OBERTHUR CARD SYSTEMS, S.A.,

8 Defendant-Counterclaim Plaintiff.

9
10
11 White Plains, N.Y.
12 February 9, 2005
10:00 a.m.

13 Before:

14 THE HONORABLE COLLEEN McMAHON,

15 District Judge

16 APPEARANCES

17
18 SUTHERLAND, ASHILL & BRENNAN, LLP

Attorneys for Plaintiff-Counterclaim Defendant

19 ROBERT A. GUTKIN

BLAIR M. JACOBS

20 NEIL G. COHEN

CHRISTINE ONDRICK

21
22 BAKER & MCKENZIE

Attorneys for Defendant-Counterclaim Plaintiff

23 JAMES DAVID JACOBS

24 FRANK M. GASPARD

25 Also present: MIREILLE CLAPIER, Obertbur Inhouse counsel

SOUTHERN DISTRICT REPORTERS, P.C.
[212] 805-0300

529bleih

1 electronic element in a little pouch to keep it safe.

2 MR. J. JACOBS: And then put air around it to keep it
3 safer.

4 THE COURT: Well, no. There could be air inside the
5 little pouch. I mean, my little pouch that I put my lipetick
6 in when I go out has air inside of it. Yes, there is air
7 outside of it, too, but that's not what's pertinent. That's
8 not what's pertinent. What it's protecting is what's inside
9 the pouch, the nonelectronic carrier.

10 MR. J. JACOBS: Yes, but, also, the recess is
11 protecting it, your Honor.

12 Here we have a slide of the figure.

13 THE COURT: No, no. The recess is the nonelectronic
14 carrier.

15 MR. J. JACOBS: Your Honor, I beg to differ. And we
16 have the '024 patent here to show you exactly what the
17 structure is in the '024 patent.

18 We have colored in red air. That's item number 14.
19 That is the buffer zone. Or 15. I'm not sure what it is. But
20 you see it, colored in red.

21 THE COURT: There can't be any air here because their
22 invention puts the electronic element directly, physically
23 touching. There is no air here between the two plastic sheets.

24 Believe me, I'm going to define these terms in such a
25 way that there cannot possibly be any air between the plastic